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Internet Banking via Mobile Devices:
A Study of Usability and Consumer Attitudes in Ireland

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Declaration

I hereby certify that this assessment is my own work and that the information contained in this submission is information pertaining to research I conducted for this project. This work has not been submitted for any other awards. All information other than my own contribution has been fully referenced and is listed in the relevant bibliography section at the rear of the project.

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Abstract

New Mobile Devices are revolutionising the way we browse the Web. Large displays, intuitive interfaces and fast data connections mean that the Mobile Web is finally fulfilling its potential. Meanwhile Internet Banking has established itself as a vital channel for customers to fulfil their financial needs and interact with their banks. As these two trends converge the possibility of consumers accessing Internet Banking services via Mobile Devices seems likely and Mobile Banking is predicted to grow considerably over the coming years.

This study examines the usability of current Internet Banking services when accessed on Mobile Devices and the attitudes of Irish consumers towards the possibility of Mobile Banking. Surveys were carried out to assess what issues were of most importance to consumers along with whether a demonstration of the service reduced these concerns.

While the sites assessed performed well in the usability study, it was found that the provision of Mobile specific sites would be beneficial. In the attitudinal survey Security was found to be the prime concern across all demographics when considering Mobile Banking followed by Ease of Use, Speed and Cost. Simple education through demonstration of the service was found to alleviate user concerns and increase the likelihood of users adopting the service.

It was found that there is a considerable potential market for Mobile Banking solutions in Ireland and with the projected growth of the sector it would be important for Irish banks to begin offering mobile specific services.

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Introduction

In recent years several mobile devices have been introduced which have claimed to bring the "real Internet" browsing experience to the pockets of consumers. While before consumers had to make do with small and low resolution displays, awkward data entry and slow rates of data transfer, they now have devices such as Apple's iPhone, Nokia's N95 and various Blackberries and Smart phones. These next generation mobile devices offer generous, vivid displays, intuitive interfaces and lightening quick 3G access. While there still are many differences between browsing the net with Internet Explorer on a desktop compared to the iPhone's Safari and Firefox on a laptop compared to Opera Mini on a Smart phone, the gap is narrowing and the full web experience is definitely coming to Mobile Devices.

As this change in the way we browse the web on the move has been taking place, Internet Banking has established itself as an important channel in the financial services industry for both personal and business customers. The largest Irish bank Allied Irish Bank (AIB) has over 490,000 active users and claims 30 million logins to the service in 2006 with growth of 21% per year. Its nearest competitor and Ireland's second largest financial institution Bank of Ireland (BOI) has over 550,000 users registered [Irish Times, 2006]. These figures represent approximately 20% to 30% of the banks customers and illustrate the popularity of Internet Banking. Increasingly retail banks are pushing this new channel with online only products such as high-interest savings accounts and credit cards that can only be applied for online. Worldwide, Internet Banking has become a staple of banking strategy from established countries such as the United States [Kolodinsky, 2001] to developing nations such as Nigeria [Chiemeke, 2006]. The increased popularity of and reliance upon broadband services across the nation coupled with the shrivelling spare time of a booming economy's population meant that Internet Banking was not just a novelty but an essential service. Banks have utilised the popularity of the service and its unparalleled convenience and speed to reach out to consumers in a new and innovative manner.

While the growth of Internet Banking over the past 10 years has been successful, experiments in Mobile Banking have been popular but not succeeded to the same extent. With the massive amount of Mobile Phone users across the globe and its increasing status as an essential item, it makes sense that both the banks and their customers should pursue Mobile Banking. There are over 3.3 billion mobile phone users worldwide and Ireland is one of 59 countries that can

claim over 100% penetration rate [Informa, 2006]. Unfortunately, the first forays into mobile banking via WAP suffered from slow and unreliable connections and users disliked the small screen size and awkward nature of data input. Further attempts using Short Message Service (SMS) were similarly unsuccessful. SMS protocol does not guarantee a set timeframe or even delivery of the messages and this adds an air of unreliability to the service [Rotimi et al, 2007]. There are also concerns over the security and possible fraud with the service [Boyer, 2008]. These factors coupled with a perception that security was not as robust as its desktop counterpart caused Mobile Banking to stutter while Internet Banking flourished. However with faster connections, more user-friendly devices and applications developed using xHTML and other standards used for desktop browsers, the potential of Mobile Banking solutions is being talked up again. In recent years banks have been attempting to get a head start on what many believe will become a huge growth market. A report by telecom analyst firm Juniper [2007] predicts "the number of consumers accessing banking services and products via their mobile phones will reach 816 million by 2011". In America, several leading banks have mobile solutions on offer already including Bank of America, Wachovia and Wells Fargo. Bank of America alone claims over 840,000 active Mobile Banking users with 224,000 enrolling in the first quarter of 2008 [Bank of America, 2008] indicating that the service is growing strongly. In the UK, Barclays have launched a Mobile Banking solution [Barclays, 2007] hoping to convert some of its 1.9 million Internet Banking customers to Mobile Banking. The Barclays site and those similar to it typically use the ".mobi" domain. This means that they are separate sites devoted to mobile users and tailored to suit their needs. Either the users goes specifically to the mobile site or the browser that is being used is detected upon the user first entering the site and they are redirected to the mobile site if a Mobile Web browser is detected. This ensures that the site the user is viewing is optimised to work best on mobile devices and offer the services that are deemed most important for mobile users. None of the Irish retail banks have mobile-specific websites in operation at the time of this study but the .mobi domain is becoming more popular with Deutsche Bank of Germany, Standard Bank of South Africa and UniCredit Group of Italy all joining Barclays in registering such domains. The interest in such sites is also not limited to financial institutions with international giants such as BMW, Hilton Hotels and Time Magazine also registering Mobile domains.

This predicted growth in mobile services is in part down to the new generation of Mobile Browsers that have become commonplace on most new Mobile Phones. Opera offers two

versions of its Mobile Browser. Opera Mini is a lightweight browser that is claimed to be able to run on any handset. While Opera has not released any figures on the amount of downloads, Opera Mini does claim to have over 44 million cumulative users [Opera, 2008]. There is also the more heavyweight Opera Mobile which takes up more space and memory on the device but which has a greater range of functions such as downloads and Flash Lite support offering a fuller browsing experience. Both browsers allow the user to integrate the bookmarks of their desktop and mobile browsers ensuring a cohesive browsing experience across platforms and further emphasising the reduced gap between the Mobile Web and the full Web. Apple's iPhone is proving as much a revolution in the Mobile Phone world as the iPod was in the MP3 world. The innovative interface has changed our perception of how we interact with our Mobile Devices and the initial lack of full 3G connectivity did not dwindle consumers' appetite to browse the Web on the Safari browser. The recent announcement of a 3G version [Apple, 2008] will only lead to more people discovering the power of the Mobile Web via the onboard Safari browser. Apple's Steve Jobs claims to have shipped over 4 million iPhones already; each with Safari preinstalled making it is one of the forerunners in the new Mobile Browser market. The old mainstays of desktop web browsing Firefox and Microsoft also have their own mobile versions with Firefox Mobile and Internet Explorer Mobile and most Mobile Devices come with some breed of browser preinstalled.

As voice calls become a commodity, data transfer is increasing becoming the solution for mobile operators searching for a new revenue stream. The promotion of free access to the social networking site Bebo by O2 and other such initiatives is a conscious effort by companies to encourage the use of mobile sites and thus increase revenue from data transmissions. Internet Banking could conceivably become such an essential site for mobile access with the correct promotion. In response to growing consumer demand and to promote usage, more operators are offering bundles of data and unlimited data packages. These are becoming commonplace in America with the main mobile operators Verizon, AT&T and Sprint offering such plans. This is driving down the cost of Mobile Web access and making it a more attractive proposition to consumers. Meanwhile there is a continuous stream of powerful new devices coming to the market with large, user-friendly screens and high-speed connectivity. Wi-Fi connectivity is also becoming a standard feature on mobile devices and even on MP3 players such as the iPod Touch, further allowing users to explore surfing the Mobile Web on the move.

As all of these factors converge, it is becoming obvious that consumers have all the pieces in place in order to use Internet Banking on the move. This study examines whether users are likely to adopt Mobile Browser Banking or using Mobile Web Browsers to cater for their banking needs. There will be a usability survey to determine whether the main Irish banks are prepared for users to access their sites in this manner. The main area of research will examine consumers' willingness to try Mobile Browser Banking, what their main concerns are and whether being provided with information to alleviate these concerns can change their perception of the service.

Literature Review

Internet Banking

Internet Banking has been in existence in Ireland in some form for 10 years now and as a channel of distribution its impact cannot be underestimated. Bradley and Stewart [1999] have shown that it should be an integral part of any banks strategy and research shows that banks in the UK and Ireland have been keen to adopt this new technology [Daniel, 1999]. The rise in computer ownership and broadband availability has lead to Irish consumers embracing Internet Banking while not completely abandoning the traditional branch [Irish Times, 2006]. Between the years of 2005 and 2007 alone the number of households using Internet Banking has jumped from 387,300 to 651,900 according to statistics from the Central Statistics Office (CSO) [2007]. This shows that Irish consumers are becoming more likely to carry out their banking needs online. From an international perspective there are many academics examining the implementation of Internet Banking in various regions such as the United States [Kolodinsky, 2001] and Malaysia [Sivanand et al, 2004]. There is also considerable research into the types of people who are utilising these services such as Amin's study of adoption among young intellectuals [2007]. This study found that young, educated individuals would adopt the service as long as there is a perceived usefulness, ease of use and credibility associated with the service. Kim et al [2005] found that users who have previous experience with electronic banking solutions are more likely to adopt Internet Banking and that education can play a part too. Similar studies into consumer adoption in Australia by Sathye [1999] showed that "security concerns and lack of awareness about Internet banking and its benefits stand out as being the obstacles to the adoption of Internet banking".

Mobile Banking

There has been considerable research into the area of Mobile Banking including analysis of the markets in Japan [Scornavacca, 2004], China [Laforet and Li, 2005] and Finland [Suoranta, 2003]. It is generally found that the likelihood of users adopting Mobile Banking solutions depends upon the perceived security of the solution with Wang investigating the need for "perceived credibility" [Wang, 2003]. Pousttchi and Schurig's assessment of mobile banking solutions [2004] identified requirements in order for security to be adequate. These were that data was encrypted, that access to data must be authorized and that this authorization process must be simple. Mobile Banking solutions should also have a perceived

ease of use. Amin et al [2007] found that banks "should develop the belief of usefulness and ease of use by providing sufficient information on the benefits of mobile banking. In order to achieve this, banks should provide user manual that contains details on mobile banking, including usefulness and ease of use". This will be explored within this study with the examination of the effect of simple education regarding the service to consumer attitudes. It has also been found that age plays a part in the likelihood of consumers to access the web via their mobile device and consequently their likelihood to access mobile banking. Senecal [2008] finds that mobile Internet usage tends to drop off sharply with age. An average of 32% of those under 39 years old were likely to use a Mobile Device to access the web with that figure dropping to an average of 21% for those over 40 years old and just 18% for those 60 years old and higher.

Mobile Usability

In order to understand the requirements for a well-built Mobile Web site, research was carried out into various aspects of Mobile Web design [Nokia, 2004] [Zhang and Adipat, 2005]. The W3C's Mobile Web Best Practices guidelines [Rabin and McCathieNevile, 2006] were used as a starting point for developing the usability study criteria. These criteria are similar to those laid out by W3C for regular websites and are created to ensure uniformity and compatibility is in place across the Internet. These guidelines were complimented by literature from usability and design analysts Webcredible [2007] and Buchanan's [2001] study of "Improving Mobile Internet Usability". It was found that the major factors to be considered when designing for the mobile web are meeting users needs quickly, ease of navigation, ease of input and mobile-friendly layouts.

It is essential that users needs be addressed quickly on mobile websites. At present the mobile web is not most users preferred way of browsing the Internet. It is something that is used to kill time or with a sense of urgency in order to gather information that cannot wait. While new devices are helping to change this attitude and encourage users to browse the web in a more leisurely fashion it is still imperative that essential information is readily to hand. The key features of the site can be determined by assessing what mobile users are most likely to want when accessing the site. In keeping with meeting users' needs, only information that is important to the user should be shown. Users will not be accessing a mobile website of a bus operator in order to arrange advertising on bus shelters. They will more than likely be looking

for a timetable or information on a particular bus route. Non-essential information should not be included or should at least be given less priority than information deemed essential. Of course it is important that users be consulted in order to determine what constitutes this essential information by encouraging a user-centric design process.

As display sizes are small and users generally do not want to scroll down through pages of unnecessary options before reaching their desired content, navigation should be as easy as possible. Most mobile browsers lack the toolbars of their desktop counterparts and it is possible that moving back and forth through the website may be difficult. Basic browsing controls should be on each page so as to ensure smooth navigation throughout the site. These controls should not however distract attention away from the essential information being displayed.

In order to minimise user frustration and errors, users should be allowed to choose from possible options instead of laboriously typing in their selections on a mobile keypad. Typing can be cumbersome on mobile devices and errors are more likely to occur. It is often difficult to correct mistakes on some devices leading to users having to start all over again. Of course some search option may be available for more advanced users.

The layout of a mobile website may be dramatically different from that of a full desktop site as screen sizes are smaller and the type of browser may not be as powerful. Many mobile browsers also realign layouts to display the content in a more efficient manner. There are countless different types of Mobile browsing applications used across many different types of phones with varying specifications. With this in mind the site should be designed for the lowest common denominator device and should attempt to render on all platforms. By ensuring that these standards are met across the major Mobile browsing platforms such as Safari, Opera, Internet Explorer Pocket and Openwave, a user friendly and effective site can be designed.

Other considerations for mobile users apart from usability include security, speed and cost. While Opera and Safari offer robust security measures such as 128Kb encryption and Secure Socket Layer (SSL) support, it is still important to build users trust in the applications. [MORE] Cost is considerably important to potential users and up until recently prohibitive charges for mobile browsing have put many users off. A report from market research group

Media Screen found that while 60 percent of broadband users own Internet-enabled devices, only 5 percent regularly use them for web access [Netpop, 2007]. Roto et al, [2007] also found that consumers are wary of the cost incurred while browsing on mobiles due to three factors; hard to know how costs cumulate, hard to follow cost accumulation and hard to control costs. They proposed better transparency of data costs from mobile operators and acknowledge the future impact of Wi-Fi connectivity being added to mobile devices.

The Mobile Web

The various solutions for browsing the Mobile Web were also examined as part of the literature review. As the demonstrations were carried out on Opera Mini, this was looked at in depth. The Opera browser has been in existence since the early days of the Web in 1995 and a mobile version has been around since 1998. It is claimed that Opera has "more than 44 million cumulative Opera Mini users worldwide" [Opera, 2008] and this would make it one of the most used Mobile browsers on the market. This figure however may include users who have downloaded more than one version of the software onto various devices and may not be representative of the true amount of users. One of the many benefits of Opera Mini is that is that it processes pages in such a way as to reduce the amount of data required and thus ensure faster loading times and lower data costs. For a more robust browsing experience, Opera also offer Opera Mobile, a more heavyweight sibling designed for smart phones and personal digital assistants (PDA). The browser preinstalled on the Apple iPhone and iPod Touch is Safari, which has many of the features of Opera. With over 4 million iPhones sold and an attractive interface this is one of the forerunners in promoting the Mobile Web. In a further sign of its influence on mobile browsing habits Citibank has embraced the device to push its Citi Mobile service. Drew Sievers of Citibank's technology partner mFoundry says the iPhone is "the sort of phone that can help to push the mobile banking service into the mainstream" [ABA Journal, 2007]. Devices that run on the Windows Mobile platform generally come equipped with Internet Explorer Mobile and Firefox, one of the world's most popular desktop browsers, has a mobile version called MiniMo. While not quite as ubiquitous as their full sized counterparts both products are actively developing new versions [CNet, 2007].

Survey Design

In order to ensure that the surveys taken as part of this study were adequately designed and garnered credible results it was important to research survey design methods and techniques for information gathering. Oppenheim's "Questionnaire Design, Interviewing and Attitude Measurement" was invaluable in the design process of the survey. Further guides by Burgess, 2001] and Sudman [1983] further informed the research into survey design techniques.

Problem Description

With over 1 million subscribers in Ireland alone, Internet Banking is now an essential channel for Irish retail banks. Early analysts may have expected it to completely replace branch banking [Nehmzow, 1997] but this has not been the case. It has however become an integral part of every banks' multi-channel delivery strategies and offers an added layer of convenience to customers and a platform on which banks can innovate with new products and methods of customer service. As mobile phones begin to offer a new platform for banks to take advantage of it is important that the views of prospective users are gathered and the likely pitfalls that may present themselves are identified. In the absence of any Irish banks providing mobile solutions at present it is important to assess this new channel and its potential.

The problem facing this study is how Ireland's major retail banks are prepared for the impending growth in demand for mobile solutions, how consumers feel about using such solutions and whether providing potential users with information can alleviate their concerns. As Mobile Banking has the ability to become such a massive growth area over the coming years, it is important to determine now how prepared these banks are for mobile solutions. The figures for devices sold and applications downloaded show that consumer are beginning to browse the Mobile Web regularly. Should these early adopters be confronted by websites with poor usability it may be off-putting. This may in turn discourage users from carrying out their banking needs in such a manner. Therefore it is important to carry out a usability study in order determine the current usability of Internet Banking sites on Mobile Devices. By doing so key areas of concern can be identified early and the correct measures be taken.

Customers' attitudes towards such a service also need to be established. Whether users are embracing the services and whether they are keen to embrace the service in the future are two pressing concerns. While the introduction of new devices and the roll out of Mobile Banking services in areas territories such as the United States indicate that this will be a growth area in the future, it is important to determine for certain that users would be willing to adopt such a service in Ireland. More importantly it is essential to establish where any potential user concerns lie and what barriers exist that would stunt the potential growth of this trend. By establishing these issues early it enables them to be addressed in the planning stages of Mobile Banking solutions and ensures a user focussed service is provided that addresses the

main concerns. As ease of use and trust have been linked to consumer adoption of Internet Banking, a user-centric design process is essential for success.

Finally it is also imperative in the introduction of Mobile Banking solutions that potential users are adequately educated in order to get the most out of the service. This process of education not only serves to benefit financial institutions by ensuring customers are more likely to use the service and reducing customer service requirements, but also benefits mobile operators as it ensures people adopt data transfer and web browsing on Mobile Devices. This is a lucrative revenue stream and would be assisted by applications such as banking coming into more mainstream use. Users would also benefit from the convenience offered by Mobile Banking and the reassurance that simple education would provide.

Proposed Solution

Usability Study

In order to assess the current state of Internet Banking on Mobile Devices, a usability study was undertaken to determine how effective Irish Internet Banking sites are when viewed on Mobile Browsers. By doing so it can be established whether the main banks are already able to accommodate users on Mobile Devices or whether these sites need to undergo a redesign in order to meet mobile web requirements.

The usability study was carried out on three of Ireland's largest banks and their Internet Banking facilities. They were Allied Irish Bank's (AIB) Internet Banking, Bank of Ireland's (BOI) 365 Online and Ulster Bank's Anytime Internet Banking. These financial institutions were chosen as they are the among the largest and most established retail banks in Ireland. Firstly, the home page of each bank's website was checked using W3C's MobileOK Basic Checker [MobileOK, 2008] to confirm if they meet the standards set down in the organisation's Mobile Web Best Practices document [Rabin and McCathieNevile, 2006]. As the bank's homepage may be a starting point for many Internet Banking users, it is important that this is mobile compliant as well as the Internet Banking site if there is no mobile specific version. Should there not be a specific mobile homepage or the homepage not render properly on a mobile device, it may put users off before they have even sampled the service. The results from the MobileOK Checker will show how prepared the banks current Internet Banking solutions are for mobile users. It performs 25 individual tests on the structure and performance of the site and reports back on what tests were failed. By analysing these failed tests in conjunction with the W3C's proposed guidelines, the key areas requiring attention can be identified.

Each site was then accessed using one of the most popular Mobile Web Browsers, Opera Mini. Following a literature review it was found that in order to perform well on Mobile Devices sites should follow certain guidelines. These include meeting users' needs quickly, ease of navigation, ease of input, important information being readily available, mobile-friendly layouts and basic browsing controls. These factors were combined to create four categories on which the sites were assessed. These were: availability of essential information, ease of navigation, nature of data input and layout and rendering. Alongside being graded on these factors, the amount of data received was also noted. In the absence of unlimited data

packages from mobile operators, it is important to gauge the cost of using Internet Banking on Mobile Browsers as cost can play a large part in users deciding to adopt a service or not [Roto et al, 2006]. Some common tasks were carried out in order to obtain a balanced view of each service. These tasks included checking account balances, viewing recent transactions on accounts and the process involved in applying fro services such as loans. While this usability study used Opera Mini running on a Nokia N95, it would be possible to carry it out on a number of mobile browsers. Initially, Internet Banking on an iPhone Safari emulator [iPhone, 2008] was intended for assessment also in order to produce a more rounded usability study. However it was found that the Internet Banking sites being assessed block emulators from viewing the site. This may be due to possible security problems posed by such applications and so the usability study on Safari was not used.

Attitudinal Survey

In order to determine the attitude of consumers towards Internet Banking using Mobile Devices a survey was carried out. The purpose of this survey was to investigate the type of consumer that is most likely to bank via their mobile phone browser, the likelihood of future take up and what factors have to most influence on people's perception of Internet Banking via Mobile Devices.

The survey gathered information on the general demographics of respondents, their attitudes towards technology, the frequency of their interactions with both Internet Banking and Mobile Devices and where their main concerns lay. The demographics established were sex, annual income, age, level of education and area of employment. With this information it could be determined whether specific demographic values played a part in consumer attitudes. It would also help indicate the likely target audiences for future Mobile Browser Banking services. Secondly, it was established what relevant devices and services the consumer owned or engaged with, and the frequency with which they were used. This information revealed the extent that the respondent was already exposed to or reliant upon certain technologies and services. Ownership of mobile phones and computers was established along with what services they utilised on these devices. This included the usage of the Internet, Internet Banking, and the Mobile Web. Where the respondent had previously used these services, their satisfaction and frequency of use was established. Where the respondent had not had previous experience with the service, their likelihood of future use was determined. The final section of

the survey dealt with various factors of concern and their level of importance to the respondent should they access Internet Banking on a Mobile Phone Browser. The factors were ease of use, security, cost of access, the presence of an attractive user interface, the range of services on offer and the speed at which information could be accessed. Respondents had to rate these factors on a 5-scale range from Very Important to Very Unimportant with Average as the median scale. These responses were weighted with Very Important being given a weight of 5 and Very Unimportant being given a weight of 1. The resulting average rating was used to determine the importance of the factor being examined. Where factors had equal ratings, whichever more respondents deemed Very Important was ranked higher.

The survey was hosted on the online survey tool Survey Monkey [2008]. This is a powerful online facility with which surveys can be created and hosted and the results analysed. In order to ensure a high response rate the survey was kept relatively simple and uncomplicated. Respondents were guaranteed of their anonymity and that no financial details would be required. This was to dispel any fears that respondents may have had regarding possible fraud or "phishing" [Downs et al, 2006] attacks. Phishing is a method of obtaining users private information by fooling them into thinking that they are viewing a reputable site when they are not. As this form of fraud is increasingly common it was important to reassure respondents that no information relating to their Internet Banking details would be required. The link to this survey was sent out via email to 95 recipients who in turn were asked to pass it on again. This method of collection may be referred to as "snowball sampling". This is a method in which existing respondents are called upon to recruit new respondents in a continuous manner. While this method is good for increasing the sample size it does have certain biases. Future respondents recruited by the existing respondents are more likely to come from similar social backgrounds. The survey was open for access via this link for 6 days and received 117 responses. Of these 117 responses, only 115 were fully completed and therefore only 115 will be analysed for the purposes of this study. Due to the fact that the survey was passed on from the original recipients to an unknown amount of others it is not possible to quantify the total number of people that received the link and therefore the total response rate. Also as the survey was carried out online, there is a considerable bias towards those who are technologically proficient as they must have some sort of online presence and technological aptitude in order to receive the link and access the survey hosting site. While this makes the survey unreflective of the opinion of the general public as a whole, it does enable it to be used as a snapshot of experienced Internet users' attitude towards Internet Banking via Mobile

Devices. It is likely that the target market of Mobile Browser banking, should it be implemented, would be made up of consumers who are already adept at Internet Banking.

Education Survey

Due to the previous lack of adequate devices on the market, high cost of data transfer and lack of user knowledge Mobile Browser Banking is still in its infancy. As a result of this it was considered important to determine the effects of simple education on consumers. This was to ascertain if consumers might consider using such a service when concerns over factors such as security and cost were addressed. Should users concerns be relieved by such basic information then it may be in stakeholders interest to provide this information to users in order to encourage take up of the service. For example, it may benefit banks to promote the security of certain Mobile Browsers on their sites as Barclays has with its mobile site [Barclay, 2008]. On it Barclays encourage the use of Opera Mini and offer links to download locations and security information for potential users. Mobile operators may also wish to promote the usability of certain banks' sites in order to encourage the use of mobile services and thus increase revenue from data transfer fees.

The survey was carried out by selecting respondents at random with no bias towards age groups, area of employment, technological competency or other factors. Overall 15 candidates were selected for the educational survey but only 13 surveys were completed in their entirety giving a total response rate of 86.6%. These respondents completed a survey identical to that used for the attitudinal survey mention previously. This was in order to gather demographic information and determine their initial views on the service. Following completion of this primary survey, the respondents were then given a brief demonstration of Internet Banking on a Mobile Devices and provided with some information relevant to the service. The demonstration was carried out on a Nokia N95 using the Opera Mini browser to access AIB's Internet Banking service. The process of starting up the browser, accessing the site and logging in by providing a registration code and security information was displayed. The services on offer, how to view balances and recent transactions were also shown to the respondent. They were also provided with information concerning the security features of Opera Mini and similar browsers, the process of inputting data and navigating with the browser and the typical data costs and speeds of the main Irish Mobile operators. This information was considered to address issues regarding security, ease of use, cost and speed

respectively. Where possible, any questions that the respondents had regarding the service were also addressed as they arose. Following the demonstration, a follow-up survey was carried out to assess whether the respondents attitude towards security, ease of use, speed, user interface, cost and range of services had changed. They were also asked for any other concerns they may have, whether they would consider using the service and the activities they thought they would most commonly use on the service. This final question of what services would be most used could be useful if the service was introduced in order to determine what services should be given priority and made most user friendly.

Results and Analysis

Usability Testing

Mobile Usability of Banks Homepages

The W3C Mobile Web Initiative [W3C, 2008] has a free online tool to check the compliance of web pages with their Mobile Best Practices 1.0 Guidelines [Rabin and McCathieNevile, 2006]. By entering the addresses of AIB, BOI and Ulster Bank's homepages and checking the results, it can be determined how prepared for embracing the Mobile Web these Irish banks are at present.

Allied Irish Bank's homepage [AIB, 2008] failed 5 of the 25 tests and presented 2 warnings. The failed tests were for the use of auto refresh and redirection on the page, not having any caching information, not having any character encoding specified, no page title defined and not using valid mark-up. The use of auto refresh or redirection on the page is negative as it may add undue costs onto the browsing session. Redirection may also add undue cost or delays to viewing the page and is similarly discouraged. Caching is the process of saving regularly accessed information in order to reduce the data required and time taken when revisiting the site at a later date. By not employing caching the browsing experience can be inefficient and slower than is necessary. By employing caching the cost of the browsing session may be reduced, as less information must be requested. By not specifying the character encoding being employed by the site, it is impossible for the browser to establish if it supports the encoding without requesting information. By explicitly defining the encoding type it ensures the browser does not have the wasted time and expense of requesting the information if it is not supported. A short descriptive title should be provided to allow users to easily identify the page when browsing history or bookmarks and make navigating to it easier. The page should also "validate to published formal grammars". This means that the mark-up of the page should conform to the standards for websites laid out by the W3C organisation in their Web Content Accessibility Guidelines [Chisholm, 1999] and other proposed guidelines.

The Bank of Ireland homepage [BOI, 2008] fared slightly worse than AIB with 8 failed tests and 117 warnings presented on the page. The failed tests on AIB's site for not caching information, not defining character encoding and not using valid mark-up were repeated here. Added to these were failings for image resizing and not specifying image size, using pixel

measures or absolute values, not having non-text alternatives, exceeding the page size limit and the use of pop-ups. By defining the size of images in the mark-up, it enables the browser to determine the size of the images in advance and layout the page appropriately. Also resizing of image should be carried out at the server if required. This reduces the amount of data that has to be transferred and thus reduces the cost and time taken to display the page. By not defining pixel and absolute measures it allows the browser to adjust the layout of the page to best suit the display being used. The use of images while browsing on mobile devices adds considerable time and cost to the browsing experience. Most browsers enable users to disable automatic loading of images. This enables users to determine the usefulness of a particular image before it is downloaded and saves time and expense. By offering a text alternative such as a brief description the page can be easily viewed in text-only form and gives the user the option to identify images deemed necessary. The Best Practices have defined specific page size limits as some devices have a maximum size that content can be and the memory on many devices is quite limited. The limit for the mark-up documentation is 10 Kilobytes (Kb) and for the entire page including images and external resources is 20Kb. The BOI page has a mark-up that is 13Kb in size and an entire page size of 38Kb. By exceeding the defined limits, the page may take too long to load up or may not even load at all on some devices. Finally the use of pop-ups on the BOI page caused a failed test. The reasons for pop-ups being discouraged are similar to those for redirection and auto-refresh. They can add undue cost onto the browsing session and are unsupported by many applications. While the presence of 117 warning on the page may seem excessive, the majority were for default values not being defined and this figure did not represent 117 different types of warning.

Finally, Ulster Bank [Ulster Bank, 2008] fared the worst of the 3 sites tested with 10 failed tests and 63 warnings. They failed tests on specifying character encoding and the use of valid mark-up as well as both AIB and BOI. They also failed tests on image resizing, measures, the use of pop-ups and exceeding the page size limit alongside BOI. Their mark-up exceeded the recommended 10Kb for documentation with 15Kb and their 54Kb size for the entire page dwarfed the recommended 20Kb outlined in the guidelines. As well as these failures they were also marked down on the use of external resources, the use of image maps and the use of tables for layout. For each external resource used, a separate request must be sent out over the network and this adds considerable time to the load time of the page. The Ulster Bank page uses over 20 embedded external resources; this may lead to excessive time to the process of loading the page. Often some mobile devices do not support the use of image maps and so

they should not be used unless it is known that the devices can support them. Ulster Bank's final failure was the use of tables to define the layout of the page. Tables do not lend themselves well to small screen sizes as they may require users to have to scroll horizontally to view content and makes the browsing experience cumbersome.

While none of the sites tested completely passed the W3C's MobileOK Checker, it would not be difficult for some to come in line with the requirements. All three sites failed for not utilising caching, not defining character support and not using valid mark-up. Not using caching may be used explicitly to prevent instances of fraud or to protect users privacy. Amending the documentation of the site can easily rectify the other two common failures. AIB performed the best in the checker and would appear to have errors that while needing attention would not have an overly detrimental effect on the users browsing experience. BOI also performed well but issues such as large page sizes and layout issues would mean their site would require more attention. The Ulster Bank site would need a considerable overhaul in order to meet the requirements. The reliance on image maps and external resources would need to be rectified and this in turn would probably reduce the considerable 54Kb page size.

Table 1. Results of MobileOK Checker

Test	AIB	BOI	Ulster
Auto Refresh and Redirection	* FAIL *	PASS	PASS
Caching	* FAIL *	* FAIL *	PASS
Character Encoding Support/Use	* FAIL *	* FAIL *	* FAIL *
Content Format Support	PASS	PASS	* FAIL *
Valid Mark-up	* FAIL *	* FAIL *	* FAIL *
Default Input Mode	PASS	PASS	PASS
External Resources	PASS	PASS	* FAIL *
Graphics for Spacing	PASS	PASS	PASS
Image Maps	PASS	PASS	* FAIL *
Image Resizing and Image Specify Size	PASS	* FAIL *	* FAIL *
Link Target Format	PASS	PASS	PASS
Measures	PASS	* FAIL *	* FAIL *
Minimize	PASS	PASS	PASS
No Frames	PASS	PASS	PASS
Non-text Alternatives	PASS	* FAIL *	PASS
Objects or Scripts	PASS	PASS	PASS
Page Size Limit	PASS	* FAIL *	* FAIL *
Page Title	* FAIL *	PASS	PASS
Pop Ups	PASS	* FAIL *	* FAIL *
Provide Defaults	PASS	PASS	PASS
Style Sheet Support	PASS	PASS	PASS
Style Sheet Use	PASS	PASS	PASS
Tables Alternatives	PASS	PASS	PASS
Tables Layout	PASS	PASS	* FAIL *
Tables Nested	PASS	PASS	PASS
Total	20/25	17/25	10/25

Allied Irish Banks - Internet Banking

Access

The website appeared quickly on the browser with a size of 28Kb and navigation to the login page was simple. The user is asked their registration number and then proceeds to a page requiring 3 digits from a 5-digit security code and a piece of personal information such as a phone number or card number. Upon the correct codes being submitted the site is entered.

Essential Information

The initial page presents users with the balance of each registered account. This is an example of essential information being easily available and checking balances would be one of the most common uses of Mobile Banking. There is a drop down menu to select an account and a button to press to view recent transactions. The selection of accounts appears in a separate window. When checking recent transactions however the ledger does not appear in the centre as it does when viewed on a desktop browser. It and the menu drop down to the bottom of the page and a white empty space appears where they should be. This rendering error leads to large amounts of scrolling in order to see essential information.

Navigation

There is no navigation explicitly for mobile users. There are no consistent navigation controls repeated on each page and options can vary depending on the section selected. The majority of the navigation is carried out via the right-side menu, which does not render correctly. This rendering error makes navigation troublesome and involves much scrolling down through pages.

Data Input

The inputting of information was laborious but this would not be considered a negative as it is in the interest of privacy and security. One possible amendment would be for the input fields to be limited to numbers and not allow alphanumeric characters. At present users must press the number 2 button four times in order to get the correct digit. If this were predefined as a numbers only text box then it would only be necessary to press the button once. The use of drop-down menus wherever possible limits user error. Applying for loan and facilities is a long process involving many screens and much data input. It would not be suited to mobile devices.

Layout and Rendering

The previously mentioned error with the display of the menu and ledgers poses the biggest problem. First time users may enter the site and become uncoordinated due to the absence of

the menu. They may also not be able to find the ledger when making enquiries about recent transactions, as they must scroll first through the length of the menu before the ledger comes into sight.

Cost

The overall amount of data that was required to access the site, login successfully and view account balances was 99Kb. A further 20Kb of data was required to view the most recent transactions.

Overall

While the process of accessing Internet Banking was simple and successful, a major flaw lay in the problem with rendering. As there is no simple navigation apart from the menu, the fact that it disappears when performing certain functions would be off-putting for users.

Figure 1. Screenshot of AIB Internet Banking on Opera Mini

Bank of Ireland - 365 Online

Access

Again entering the site and locating the login page for 365 Online was relatively simple with the link standing out from its surroundings. Users must specify whether they are Republic of Ireland or Northern Ireland customers. BOI employ a similar level of security to AIB with a personal registration number required combined with the users date of birth and 3 digits from a 5-digit security code. Upon the correct codes being submitted the site is entered.

Essential Information

As with AIB the initial page shows account balances for all the users accounts. The account names a links that may be selected to display the recent transactions. The menu is consistent along the right hand side of the page and various sections may be chosen from here easily enabling quick access to essential information.

Navigation

While there are no buttons for browsing back through the site, the menu remains consistent along the right and enables easy navigation. Clearly identified links ensure that users know where additional navigation options are.

Data Input

The inputting of information was laborious but again this would not be considered a negative as it is in the interest of privacy and security. Again a possible amendment would be for the input fields to be limited to numbers and not allow alphanumeric characters. At present users must press the number 2 button four times in order to get the correct digit. If this were predefined as a numbers only text box then it would only be necessary to press the button once. The requirement to include a backslash between day, month and year when providing the date of birth for login could also be removed so as to limit unnecessary keystrokes.

Layout and Rendering

There were no issues with the layout and rendering of the site. The uncomplicated theme translated well to the mobile screen. Different sections of the page were clearly identifiable.

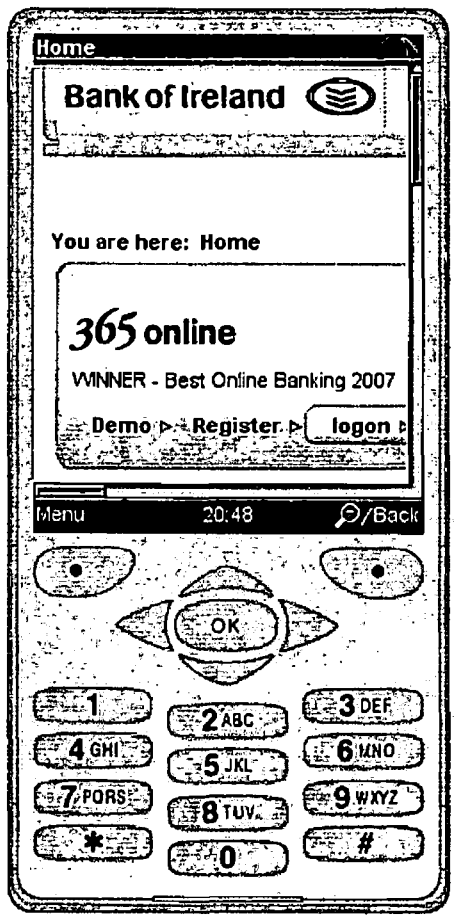
Cost

The overall amount of data that was required to access the site, login successfully and view account balances was 107Kb. A further 24Kb of data was required to view the most recent transactions. This was the largest amount of data that was required out of the three sites assessed in this study.

Overall

The site performs consistently and is easy to navigate and use. However it does fall down in having unnecessary data entry requirements and carries a larger cost than its competitors.

Figure 2. Screenshot of BOI 365 Online on Opera Mini



Ulster Bank - Anytime Banking

Access

Upon entering the Ulster Bank website it is difficult to locate the Anytime Banking login link as it does not stand out from the other links alongside it. Once click on the login screen is presented and a 10 digit customer code is requested. Once this is provided 3 digits from a 4-digit PIN code are required along with 3 digits from an 8-digit password. Successful completion of these security measures produces a screen giving details of the last login to the site and a request to confirm this. This ensures that the user is aware of any unauthorised access.

Essential Information

The balances of all accounts are shown on the first page encountered as with competitor services. Below the account details are links for account details and to view full statement of transactions. Mobile users would regularly access these options and so this is an example of good access to essential information.

Navigation

Navigation is carried out via the right hand side menu, which appears consistently throughout while viewing account details. On the left side are details about products on offer. On following these links however the user is taken back to the main Ulster Bank site and away from the Anytime Banking site. This may cause confusion for users. Also adverts for some functions such as the online help service appear but links are not operational which may also lead to confusion.

Data Input

Data input was laborious due to the use of the keypad but certain aspects of the site's security did not help. The use of a password that must include capital letters and numbers means that users must switch between character sets when inputting. While this can be acknowledged as important for security reasons, the use of numeric security codes by AIB and BOI is simpler to input.

Layout and Rendering

Layout and rendering were well handled with the site using a simple interface. The switch between the Internet Banking site and the regular site was confusing as there was no explicit difference between the two. One problem occurred when trying to apply for a credit card with this causing a server exception but a mobile user would rarely carry out such a task.

Cost

The overall amount of data that was required to access the site, login successfully and view account balances was 77Kb. The majority of this was taken up by the Ulster Bank homepage with this accounting for 46Kb. The Internet Banking site itself was very low on data required. A further 11Kb of data was required to view the full statement of transactions.

Overall

Despite a data intensive homepage, Ulster Bank's Anytime Banking was low on cost and simple and effective to navigate. The lack of distinction between the Internet Banking and homepage could cause concern for users along with errors caused by some functions but overall it performed very well.

Figure 3. Screenshot of Ulster Bank Anytime Banking on Opera Mini

Attitudes Survey

Demographics

The respondents of the survey were quite an even balance of male and female, with a 57.4% to 42.6% split in favour of males. Both genders had quite similar concerns with security the top priority with a rating of 4.91 for males and a slightly higher 4.98 for females. This was followed by speed, ease of use and cost respectively in males. Women also followed with ease of use but placed more importance on cost than speed reflecting the more patient nature of females. While user interface and range of services on offer were of least importance to both sexes, women rated the range of services as 4.35 compared to males 3.86, showing a significant difference with women obviously favouring a wide variety of choice. Males were nearly twice more likely than females to have tried Mobile Browser Banking before with 7.6% compared to 4.1% and were also more likely to try it in the future with 57.4% compared to 42.6% for females.

Every person surveyed had attained education to at least Leaving Certificate level. 87.8% had attained some sort of post Leaving Cert qualification and 76.5% were university educated. For the purposes of this analysis university educated is defined as having attained a Degree, Masters or PhD qualification. Although it was not the attention of this survey to only gather the attitudes of educated individuals, the fact that no respondents were of a low level of education may be construed as a bias in the results. Those who were university educated were among the most likely to have attempted Mobile Browser Banking with 8.0% of respondents having tried it before. An overall higher acceptance level of technology was evident in those with an education of degree level or more. University educated respondents had a better knowledge of the capabilities of their devices with 79.5% knowing their device had Internet capability and 35.2% knowing it had 3G connectivity. This shows a considerable difference from non-university educated with only 18.5% knowing of 3G capability. Those with a higher level of education were also more likely to access the Internet on a daily basis, use Internet Banking and mobile browsing. These figures show that those with a university education are more willing to adopt new services and products. As with all respondents, security was the prime concern with a rating of 4.93 followed by ease of use with a 4.73 rating. While cost and speed had the same average rating of 4.65, more respondents cited cost (71.6%) than speed (68.2%) as very important. This may be due to some respondents still being in full time

education and not having a significant disposable income. Cost would therefore be a major consideration whereas those in full time employment would have more of a discretionary budget to spend on phone bills and credit.

Financial Services and Insurance (41.7%) and Information Technology (IT) (13.9%) were the most common areas of employment followed by students (7.8%). Media, Education and Other closely followed these categories with 7.0% each. The high volumes of respondents from these areas may be due to Financial Services and IT being the two areas that this particular survey would be considered most closely linked with. Respondents from these sectors would be most interested in the topic as it relates their profession and therefore more likely to respond. Respondents from these two sectors were generally young males educated to degree level.

Table 2. Demographic Features of Respondents

Attributes	Demographic Distribution	
	Frequency	Percentage %
Sex		
Male	66	57.4
Female	49	42.6
Age		
Under 20	1	0.9
21 - 30	81	70.4
31 - 40	24	20.9
41 - 50	6	5.2
Over 50	3	2.6
Education Level		
Junior Cert	0	0.0
Leaving Cert	14	12.2
Diploma	9	7.8
Certificate	4	3.5
Degree	68	59.1
Masters	19	16.5
PhD	1	0.9
Area of Employment		
Banking/Financial Services/Insurance	48	41.7
IT/Telecommunications	16	13.9
Construction/Engineering	6	5.2
Media/Advertising	8	7.0
Entertainment	2	1.7
Tourism/Hospitality	3	2.6
Education	8	7.0
Government	0	0.0
Health Care	6	5.2
Manufacturing	0	0.0
Student	9	7.8
Unemployed	1	0.9
Other	8	7.0

Age

Respondents were overwhelmingly between 21 and 40 years of age. 21–30 years old accounted for 70.4% of respondents and 31–40 years old accounted for 20.9% with an overall total of 91.3% between 21 and 40 years old. While security was also the number one concern across age groups there was a clear trend of it becoming more of a concern with age. This is perhaps as a result of older generations having less interaction with technology throughout their lives while young people in Ireland utilise it in various aspects of life. Those under 30 rated security 4.93, the 31–40 age bracket rated it 4.96 and those over 40 years gave it a full 5.00 rating with 100% of respondents considering it very important. There was an inverse of this trend regarding speed with those under 30 years old giving it a 4.67 rating, 31–40 a 4.63 rating and over 40's a 4.56 rating. This reflects the increasing demands of younger people for faster and more efficient devices as standards improve and broadband access becomes the standard across the country.

Figure 4. Trend of Importance of Security across Age Groups

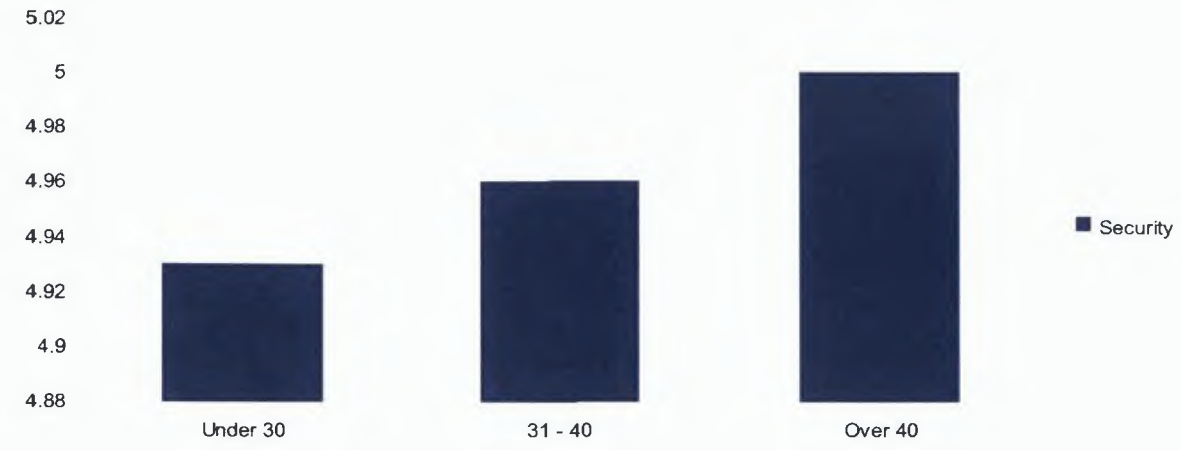
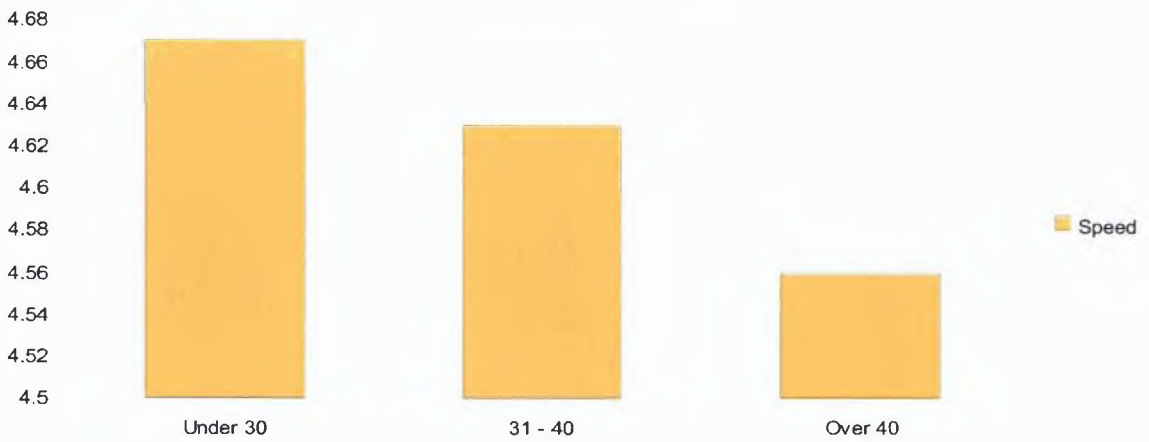


Figure 5. Trend of Importance of Cost across Age Groups



Income Level

There was a fairly even spread of different levels of salary with €20–30k being the most common level with 29.6% of respondents followed by €31–40k. Security topped the ratings again across all salary brackets with those on less than €20k the most concerned. They rated security at 5.00 with 100% labelling it very important. As consumers with a low level of income would not be able to manage unforeseen financial circumstances such as the theft of savings due to fraud security would be of the utmost importance. Despite having the lowest rating for security at 4.91, the €21–30k salary bracket place more importance on cost of use than any other age group with a 4.79 rating. This is marginally more than that of the under €20k group with their 4.78 rating of cost. This shows that those with lower earning place

more importance on getting value for money from their services that those with higher earnings. This €21–30k bracket was the most likely to have tried using Internet Banking via a Mobile Device (8.8%) reflecting a willingness to try out new services.

Table 3. Salary of Respondents

Income Level (Euros)	Demographic Distribution	
	Frequency	Percentage %
Under 20k	18	15.7
20k - 30k	34	29.6
31k - 40k	27	23.5
41k - 50k	15	13.0
50k +	21	18.3

Technological Ownership

Ireland's 114% mobile penetration rate [Central Statistics Office, 2007] was reflected in 100% of respondents being mobile phone owners. Of these mobile phone owners, 79.1% owned phones that were capable of Internet access with 13.9% not having such access and 7% not knowing if their device was capable. Furthermore, only 31.3% of these devices were 3G enabled with the majority either not able to (48.7%) or the owners not sure (20%). With Irish 3G licenses costing in the region of €44.5 million it is surprising that less than a third of respondents have 3G devices. Those who have 3G enabled devices were among the most likely to have already tried Internet Banking via a Mobile Device (8.3%) and also to think that they may try such a service in the future (60.6%). These figures are significantly higher than those without or unsure of 3G functionality on their device. Only 46.7% thought they would be likely to use such a service in the foreseeable future.

Personal computer (PC) and Laptop ownership was slightly higher than national statistics from the CSO suggests. 87.8% of respondents owned a PC or Laptop, slightly higher than the 65% of households surveyed by the CSO. This higher figure may be due to the fact that this survey was only sent out to those with an online presence who would be more likely to own a computer.

Usage of Internet and Mobile Web

The majority of respondents accessed the Internet on a daily basis with 74.8% going online several times a day and 14.8% once a day. The remaining respondents accessed the Internet either a few times a week (8.7%) or a few times a month (1.7%). No respondents described their frequency of accessing the Internet as rarely. The lack of responses from infrequent Internet users is due to the fact that the survey was distributed online. The concerns of those who accessed the Internet on a daily basis was comparable to the average respondent with security the main concern, followed by ease of use, speed and cost with range of services and user interface the least important. Their likelihood of using Internet Banking via Mobile Devices in the future is slightly above average with 53.1% of daily Internet users considering it a possibility for the future.

The proportion of those who have accessed the Internet using a mobile device and those who have not is split 60.9% and 39.1% respectively. Males were found to be the most likely to access the Internet on a Mobile Device with 71.2% responding positively, compared to 46.9% of females. There was a level of dissatisfaction towards the service however that was quite similar across the sexes with 66% of males and 69.6% of females not satisfied with the experience. This level of dissatisfaction may explain why the majority (64.3%) of respondents describe their frequency of use as very rarely. This was followed by 12.9% describing it as daily and the 12.9% again as a few times a month. Dissatisfaction may also be attributed to the device that respondents are using. As mentioned previously, 68.7% of respondents either have phones that are not 3G enabled or are unsure of their phones capabilities. If users are accessing the Mobile Web on devices with slow connections it may cause an unfulfilling browsing experience due to long wait times and poorly displayed sites. As would be expected those who have never accessed the Internet via a Mobile Device are the least likely segment to use Internet Banking on a Mobile Device in the future. Only 34.9% would consider it in the future and this is significantly lower than the 50.9% of average respondents and the 61.5% of respondents who have accessed the Internet on a Mobile Device that would consider the service. As they have never used a Mobile Device to browse the Web it is obviously unlikely they would do so purely to access Internet Banking and such users would be part of banks' potential target market.

Usage of Internet Banking

The usage of Internet Banking among respondents reflects the growth of the channel over recent years into an invaluable service for both banks and consumers. 90.4% of respondents use Internet Banking, with 67.4% of these users logging on once a week or more. Of the 9.6% that do not use Internet Banking, 72.7% would consider using it in the future. Out of all respondents only a mere 2.6% would not consider using Internet Banking in the future. The level of satisfaction with the service is evident from responses. Again there is a slight discrepancy between the sexes with 100% of females but only 96.4% of males satisfied. This however does not take away from the overall level of satisfaction with 98.1% happy with the service currently on offer. A high proportion of Internet Banking users have accessed the Internet via a Mobile Device (60.6%). This shows that users of Internet Banking are adept at using the Mobile Web also and so would be expected to find the prospect of using Mobile Browser Banking relatively unchallenging. This likelihood to adopt Mobile Banking is also shown with an above average 54.6% saying they would consider the service in the future.

Usage of Internet Banking via Mobile Devices

The fact that Mobile Browser Banking is in its infancy is emphasised by the lack of people who have tried it. Only 6.1% of respondents have tried accessing Internet Banking via their Mobile Device. Of the few who have tried it, 75% found the experience satisfactory with speed being the main factor of dissatisfaction followed by poor layout and a lack of ease of use. The reason for speed being a cause of dissatisfaction may be attributed to 57.1% not having 3G enabled devices. With a faster Internet connection, speed may not be a concern and the experience may be more satisfying. The majority of these early adopters are between the ages of 21 and 30 and University educated with either a Degree or Masters qualification. They all access the Internet daily and access Internet Banking at least once a week. Despite a low number of respondents having tried Mobile Browser Banking there are signs that this channel of accessing Internet Banking has potential. 50.9% of non-users would consider accessing their Internet Banking on a Mobile Device in the future. This accounts for 47.8% of all respondents and given AIB's estimated 490,000 Internet Banking users and BOI's 550,000, this represents a potential market of 234,220 and 262,900 Mobile Browser Banking users for each bank respectively if such a service was to be implemented.

Factors affecting Internet Banking via Mobile Devices

The resounding cause of concern that was found across all demographics of respondents was security with an average rating across of 4.94. Those most concerned with security were respondents earning less than €20k and those over 40 years old. Every member of these groups chose security as very important leading to a 5.00 rating. Those who do not use Internet Banking have the most casual attitude to security with a 4.82 rating. While this was the lowest rating for security across all groups, there was still major concern for this aspect of the service with 81.8% ranking security as very important and the remaining 18.2% ranking it as important. This serves to underline that security is the most significant concern of potential users of this service.

Following security there is a drop in ratings and then a cluster of three similarly rated concerns; ease of use, speed and cost. Ease of use obtained an average rating of 4.70 and tops this group of secondary concerns. It is a significant factor across all age groups. Respondents earning under €20k and those over 50 years old were the two demographics that rated it highest. Its universal importance highlights the fact that while users are on the move and using a Mobile Device they require a service that meets their needs instantly and does not require significant training to operate. Next in this secondary group is speed with a 4.65 rating. While speed was not explicitly defined to respondents, it could be taken to refer to the rate at which the device receives information or the rate at which information can be found on the Internet Banking site. Speed was of most importance to those in the 31–40 age bracket and those earning over €40k per annum. The importance places on speed by these particular demographic groups may indicate that those in a time-poor situation with young children or a busy job value the speed at which they can access their data. The last of this secondary group and fourth in overall importance was cost with an average rating of 4.62. Cost was defined to respondents as credit used or cost on a phone bill. While not of major concern to respondents cost is still a factor. In the future the importance of this issue may become less significant as Mobile Operators move towards unlimited data packages and the price of data becomes lower.

Following this secondary group there was a group of factors that may be considered of little importance to respondents. The range of services on offer and the presence of an attractive user interface achieved ratings of 4.07 and 3.84 respectively. The lack of concern for a wide range of services may be due to there only being a limited number of services that users would be likely to want to access on a mobile device. Services that may be done quickly and

can sometimes not wait until a desktop computer is found such as checking balances and topping up mobile credit would satisfy a large portion of users. Customers are unlikely to apply for an overdraft facility or another time-consuming task via their mobile device and would be likely to wait until they have access to a desktop computer. The lack of importance place on range of services does mean that banks intending to implement mobile solutions could start these services with just basic functions such as balance checking. Further services could then be added on a rolling basis pending user demand.

The lack of concern for an attractive user interface explains a lot about what consumers want from their Mobile Banking solutions. That Ease of use is considered Very Important by 72.2% of respondent and Attractive User Interface considered Very Important by only 24.3% is significant. There is almost three times as importance placed upon the experience being easy to use as there is on it being easy on the eye. This shows that it would be a waste of time for banks to design a fancy user interface unless there is an underlying architecture which is simple and effective to use and meets consumers' needs.

Table 4. Average Ratings of Factors of Importance

	Very Important	Important	Average	Unimportant	Very Unimportant	Rating Average	Response Count
Security	**93.9%** **(108)**	6.1% (7)	0.0% (0)	0.0% (0)	0.0% (0)	4.94	115
Ease of Use	**72.2%** **(83)**	25.2% (29)	2.6% (3)	0.0% (0)	0.0% (0)	4.70	115
Speed	**69.6%** **(80)**	26.1% (30)	4.3% (5)	0.0% (0)	0.0% (0)	4.65	115
Cost of Use	**71.3%** **(82)**	20.0% (23)	7.8% (9)	0.9% (1)	0.0% (0)	4.62	115
Range of Services on Offer	32.2% (37)	**43.5%** **(50)**	23.5% (27)	0.9% (1)	0.0% (0)	4.07	115
Attractive User Interface	24.3% (28)	**40.9%** **(47)**	29.6% (34)	5.2% (6)	0.0% (0)	3.84	115

Education Survey

Demographics

The demographic trends of the educational survey were slightly different to those of the attitudinal survey. There was a relatively even split between males and females with the majority (53.8%) of respondents female. Again the age group from 21–30 was the most dominant with 38.5% but there were more respondents from older groups with those over 40 years old accounting for 30.8% of respondents. This may be attributed to this survey being carried out offline and therefore more likely to attract older respondents. The educational level of respondents was fairly mixed with 38.5% of respondents having attained Leaving Certificate level followed by 30.8% having attained 3rd Level Degrees. Financial Services and Hospitality equally dominated area of employment with both claiming 23.1% of the respondents. Student, IT and Other followed these with 15.4% each. There was a fairly even distribution among the income level of respondents also with the majority (38.5%) earning €31-40k followed by 30.8% on under €20k and 23.1% on €20-30k.

Technological Ownership and Usage

Ownership and usage of Mobile Devices and the Internet was very much in line with previous findings. In keeping with CSO statistics [Central Statistics Office, 2007], 100% of respondents owned a mobile phone. Of these mobile phones, 76.9% were able to access the Internet but 92.3% of respondents either didn't have 3G connectivity or did not know if their device was capable of such connectivity. This is greater than the 68.7% in the previous survey but serves to further highlight the lack of 3G services and promotion of these services in this country. Most respondents owned a PC or laptop (84.6%) with 76.9% accessing the Internet at least a once daily basis. Internet access on Mobile Devices was also common with 69.2% of respondents having tried used such connectivity and 66.7% of them being satisfied with the service. They were however less frequent in their use with 55.6% only using the service once a month and 33.3% using it very rarely. Of those who had not accessed the Internet via a Mobile device, 50% would consider it in the future. The respondents were mostly adept at Internet Banking with 76.9% having used it previously; of these users 100% were satisfied with the service. This level of satisfaction is reflected in the frequency of use with 80.0% of respondents using Internet Banking at least once a week. The level of people that have used Internet Banking via a Mobile Device was15.4%, more than double the 6.1% of the attitudinal

survey. Of these early adopters, 100% were satisfied with the service. Of the 84.6% of those who had not tried such a service, 54.5% said they would consider it in the future.

Initial Factors

The main factor that was of concern for the respondents was again security with 92.3% tagging it as very important. Interestingly however its average rating was 4.85, equal to that of ease of use although this was only tagged as very important by 84.6% of respondents. In keeping with the findings of the previous survey, security and ease of use were followed by speed with a rating of 4.69 and cost with a 4.54 rating. The least important factors were range of services on offer and user interface with 4.15 and 3.69 respectively. All of these factors follow the trend laid out by the attitudinal survey in the order of priority placed on each.

Post Demonstration Factors

Following the demonstration and provision of basic information to the respondents there was a noticeable shift in participants' attitudes towards Internet Banking on Mobile Devices. Each factor experienced considerable change in the before and after figures. The factors deemed most important; security, ease of use, speed and cost all experienced a drop in their ratings as concerns were addressed. Security was overtaken by ease of use as the factor of most importance to respondents. The provision of information on the level of security and encryption provided by Mobile Browsers made security drop from 4.85 to a 4.46 rating. While ease of use also experienced a drop it was not as pronounced with it dropping from 4.85 to a 4.69 rating. The level of importance placed on speed and cost both dropped in equal measure of 0.54 with speed moving from 4.69 to 4.15 and cost moving from 4.54 to 4.00. The smallest drop in rating was for range of services, which was considered trivial to begin with. It dropped by 0.15 from 4.15 to a 4.00 rating. The only factor to increase in concern prior to the demonstration was user interface. While the attitudinal survey showed that users value ease of use over an attractive user interface, this survey showed the detrimental effect that having a user interface not designed for mobile devices has. The rating for user interface jumped 0.69 from 3.69 and last place in the rankings to 4.38 and third place in the rankings. This can be attributed to the layout of AIB's Internet Banking appearing poorly on Opera Mini as indicated by the usability study. If the site was designed to conform to mobile browser standards or a mobile specific site was available, such a jump in concern would probably not occur.

Adoption Rate

Despite concerns about the user interface of the site, the provision of education had an overall positive effect on respondents' attitudes towards the service. Prior to the demonstration 54.5% of respondents would consider using Internet Banking on a Mobile Device in the future. Following the demonstration this had increased by 30.1% to 84.6%. Of the 15.4% who would not consider using the service in the future there was an evident reluctance to adopt new technology with them not expecting to use Internet Banking or Mobile Internet access.

Key Activities

The final part of the educational survey was to determine, following a demonstration of the service, what activities respondents would see themselves most likely to carry out. The most common activity was checking balances or recent transactions with 100% of respondents. This was followed by paying bills with 61.5%, topping up mobile phone credit with 46.2% and transferring money with 38.5%. Share dealing and applying for loans or mortgages were not chosen by any respondents as a likely activity to be carried out. These findings show that users are most likely to use Mobile Browser Banking for services that are quickly done and may have a level of urgency about them. Checking balances, topping up credit and paying bills or transferring money could all conceivably be carried out using the bare minimum of browsing and data input. This would be especially true if users information about frequently used accounts and personal details such as phone numbers were saved across both Internet Banking and Mobile Banking solutions.

Future Work

The usability study could be carried out more extensively as part of future work. The study has some limitations as it only uses the Opera and Safari mobile browsers. While these are two of the most popular browsers available at the moment, carrying out the study on a wider range of browsers would give a broader view of the usability of the sites. The study was also only carried out on three Irish banks. There are many other retail banks present in Ireland with institutions such as Halifax and Royal Bank of Scotland increasing their market share rapidly. These banks also offer Internet Banking solutions and for a complete view of the service in Ireland their solutions should also be examined. Also the usability study is comprised from only one opinion of the sites. By having several different people assess the services and compiling the results a more informed opinion may be gathered. Finally the stud was gathered from only short-term use of these sites on a Mobile Device. A study could be carried out assessing the long-term use of these sites and whether small screen size or poor input capability can lead to frustration with the service over the course of regular use.

While the survey method used provides reliable results, there are some flaws and biases present. It was consider adequate that the attitudinal survey was wholly conducted online as the market most likely to use Internet Banking on Mobile Devices and to be targeted by banks for such a service are those who are already comfortable with online banking. An area of future work however may be to carry out a survey either entirely offline or mixing both offline and online in order to get a better view of the population as a whole. The survey was also kept relatively brief and simple in order to maximise response rates and ensure easily quantifiable results. Answers were definitive and open-ended questions were kept to a minimum. It may be of interest to carry out interviews on this subject matter in order to gain a more in depth assessment of where potential users concerns lie and what the barriers to them adopting such a service are. For example this survey did not account for issues such as users not being able to access mobile sites due to accessibility issues like poor eyesight or disability. Using an interview method would allow all aspects to be fully explored.

While this study refers to Irish retail banks and the demographics of Irish society it may not be reflective of only Irish attitudes. As the attitudinal survey was carried out online and could be accessed by anyone from across the globe, there is no guarantee that the views reflected are all from Irish consumers. By carrying out the survey and asking respondents to give their

nationality or blocking non-Irish IP addresses it would be possible to get a completely Irish opinion on the subject.

One factor that was not investigated fully in this study was the possibility of fraud within Mobile Banking solutions. As Mobile Browser Banking does not require the storage of any personal information on the handset this reduces the possibility for unwarranted access occurring if the device is stolen. But as phones begin to start utilising Wi-Fi technologies that are easily hijacked by hackers, there could be serious concerns with regard to personal data being accessed and even funds being stolen. An important aspect of future work would be to identify threats and propose safeguards against possible forms of fraud that may affect such a solution in the future.

Conclusions

It has been found that Mobile Banking is expected to grow in popularity over the coming years and banks are starting to prepare their services now to achieve competitive advantage. Several major financial institutions in the United States have launched mobile services and it is only a matter of time before Irish banks follow suite.

Irish banks current Internet Banking services are perform satisfactorily on Mobile Devices but are not designed specifically for that purpose. Should a financial institution take the lead in this field there would be considerable benefit to be made from having first mover advantage in a massive growth area. While Irish banks have not implemented any solutions at present there is a sizeable potential market. The attitudinal study reveals that between the two largest Irish retail banks alone there is a potential market of nearly 500,000 users of Mobile Banking and the continued successful sales of devices such as Apple's iPhone will continue to promote the use of the Mobile Web.

The primary concerns of potential users are security and ease of use of the service. The provision of education regarding these issues can have positive effects on user concerns but it is imperative to the success of Mobile Banking that security is as robust as possible and that the user experience is simple and satisfactory.

However there are some flaws with this study. The usability study did not extensively cover all possible banks and Mobile Web Browsers and did not take multiple opinions into account. Therefore it only gives a limited snapshot of the performance of Irish Internet Banking via Mobile Devices. The survey is not reflective of Irish society as a whole and only focuses on existing Internet users.

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Appendix A – Attitudinal Survey

Sex

- Male
- Female

Age

- Less than 20
- 21-30
- 31-40
- 41-50
- 50 +

Education Level

- Junior Cert
- Leaving Cert
- Diploma
- Certificate
- Degree
- Masters
- PhD

Area of Employment

Banking/Financial/Insurance
IT/Telecommunications
Construction/Engineering
Media/Advertising
Entertainment
Tourism/Hospitality
Education
Government
Health Care
Manufacturing
Student
Unemployed
Other

Income Level (Euros)

- Under 20k
- 20k - 30k
- 31k - 40k
- 41k - 50k
- 50k +

Do you own a Mobile Phone?

- Yes
- No

Is your Mobile Phone able to access the Internet?

- Yes
- No
- Don't Know

Is your Mobile Phone 3G enabled?

- Yes
- No
- Don't Know

Do you own a PC or Laptop?

- Yes
- No

Which of the following best describes how often you access the Internet?

- Several times a day
- Once a day
- A few times a week
- A few times a month
- Rarely
- Never

Have you ever used a Mobile Phone to access the Internet?

- Yes
- No

<u>If Yes:</u> How often would you use a Mobile Phone to access the Internet?

- Daily
- Once a week
- A few times a month
- Very Rarely

Do you find the service satisfactory?

- Yes
- No

<u>If No:</u> Would you consider using a Mobile Phone to access the Internet in the foreseeable future?

- Yes
- No

Do you use Internet Banking?

- Yes
- No

<u>If Yes:</u> How often do you use Internet Banking?

- Daily
- Once a week
- A few times a month
- Very Rarely

Do you find the service satisfactory?

- Yes
- No

<u>If No:</u> Would you consider using Internet Banking in the foreseeable future?

- Yes
- No

Have you ever used a Mobile Phone to access Internet Banking?

- ❑ Yes
- ❑ No

<u>If No:</u> Would you consider using a Mobile Device to access Internet Banking in the foreseeable future?

- ❑ Yes
- ❑ No

<u>If Yes:</u> Did you find the experience satisfactory?

- ❑ Yes
- ❑ No

<u>If No:</u> what were the main factors for the experience being unsatisfactory? (Check as many as applicable)

- ❑ Lack of Security
- ❑ Poor Design/Layout
- ❑ Not Easy to Use
- ❑ Poor range of services
- ❑ Speed
- ❑ Cost

Please rank the following based on how important you consider them if accessing Internet Banking on a Mobile Phone

	Very Important	Important	Average	Unimportant	Very Unimportant
Attractive user interface					
Range of services on offer					
Security					
Ease of use					
Speed					
Cost of use					

Appendix B – Educational Survey

Bearing in mind the information you have just been given...

Please rank the following based on how important you consider them <u>following the demonstration</u>

	Very Important	Important	Average	Unimportant	Very Unimportant
User interface					
Range of services					
Security					
Ease of use					
Speed					
Cost of use					

Are there any other issues apart from those listed above that would cause you concern? Please outline below...

Could you see yourself using Internet Banking on a Mobile Device in the future?

- ☐ Yes
- ☐ No

What would you be most inclined to use it for? (Check as many as applicable)

- ☐ Checking Balances or Recent Transactions
- ☐ Transferring Money
- ☐ Share dealing
- ☐ Applying for loans/mortgages/etc
- ☐ Paying Bills
- ☐ Topping Up Mobile
- ☐ None of the above